CLAIMS

1. A method for positioning a mobile station, comprising: the mobile communication network, when receiving a positioning request from a mobile station, instructing repeaters to send auxiliary positioning signals, and the mobile station measuring the position estimation parameters according to the received auxiliary positioning signals sent from the repeaters and downlink signals sent from the base station, and then estimating the position of the mobile station according to the measurement results, and thereby implementing the positioning of the mobile station.

2. The method for positioning a mobile station according to claim 1, further comprising:

a. the mobile communication network, when receiving a positioning request from the mobile station, instructing the serving base station to measure Round Trip Time (RTT) between the serving base station and the mobile station, receiving the measurement result reported from the serving base station, and at the same time sending a measurement control message to the mobile station;

b. determining all repeaters that take the serving base station as a donating base station, configuring auxiliary positioning parameters for the repeaters, and controlling the transmission of auxiliary positioning signals of the repeaters to the mobile station;

c. the mobile station measuring TDOAs between the base stations and the repeaters according to the measurement control message sent from the mobile communication network and the auxiliary positioning signals sent from the repeaters, and

reporting the measurement results to the mobile communication network;

d. the mobile communication network estimating the position of the mobile station according to the received RTT between the serving base station and the mobile station as well as TDOAs between the base stations and the repeaters, and thereby determining the position of the mobile station.

3. The method for positioning a mobile station according to claim 2, wherein said auxiliary positioning parameter includes: Idle Period DownLink (IPDL) parameter, the scrambling code assigned to a repeater, and carrier frequency and transmission power(s) of the auxiliary positioning signals.

4. The method for positioning a mobile station according to claim 2, wherein said auxiliary positioning signal is a Primary Common Pilot Channel (P-CPICH) modulated with the scrambling code synchronized with the base station and is sent only during IPDL.

5. The method for positioning a mobile station according to claim 2, wherein said measurement control message in step c comprises: information of the serving base station and information of the adjacent base stations; said information of the serving base station comprising the primary scrambling code of the serving base station; said information of an adjacent base station comprises primary scrambling code of the adjacent base station, Relative Time Difference (RTD) between the adjacent base station and the serving base station, and width of the search window.

6. The method for positioning a mobile station according to claim 5, wherein said measurement control message also

comprises information of repeaters inserted in the information of the adjacent base stations, which comprises: scrambling codes of the repeaters, RTDs between the serving base station and the repeaters, and widths of the search windows.

7. The method for positioning a mobile station according to claim 6, wherein said RTDs are determined according to the distances between the repeaters and the serving base station as well as the IPDL parameters, or obtained by measurement using a Location Measurement Unit (LMU).

8. The method for positioning a mobile station according to claim 5, wherein said scrambling code of a repeater is one of 512 primary scrambling codes and is different from those of adjacent base stations individually.

9. The method for positioning a mobile station according to claim 6, wherein said step d comprises:

d1. the mobile communication network searching in the measurement results of TDOA according to the scrambling codes of the repeaters and determining whether the mobile station is within the coverage area of repeaters according to the measurement results; if so, executing step d2; otherwise executing step d3;

d2. correcting the measurement results and estimating the position of the mobile station;

d3. estimating the position of the mobile station directly with the measurement results.

10. The method for positioning a mobile station according to claim 9, wherein said step d1 comprises:

d11. the mobile communication network, according to the scrambling codes of the repeaters, determining whether the measurement results of TDOA from the mobile station contain

a TDOA, the scrambling code corresponding to which being that of a repeater; if so, executing step d12; otherwise executing step d3;

d12. determining the time delay and coordinate of the repeater according to the obtained scrambling code of the repeater, and working out the distance between the repeater and the serving base station;

d13. determining whether the TDOA corresponding to the repeater is approximately equal to the sum of time delay of the repeater and the time value obtained through dividing the distance between the repeater and the serving base station by the speed of light; if so, executing step d2; otherwise treating the repeater as a pseudo adjacent base station and executing step d3.

11. The method for positioning a mobile station according to claim 9, wherein said step d2 comprises:

d21. determining the Time of Arrival (TOA) between the serving base station and the mobile station, the time delays of the repeaters, the distances from the repeaters to the serving base station, the TDOAs between the adjacent base stations and the serving base station, and the TDOAs between the repeaters and the serving base station;

d22. subtracting the TDOAs between the repeaters and the serving base station from the TDOAs between the adjacent base stations and the serving base station to obtain the TDOA between the adjacent base stations and the repeater; subtracting the time value obtained through dividing the distances between the repeaters to the serving base station by the speed of light from the TOA between the serving base station and the mobile station, and subtracting the time

delays of the repeaters from the above-obtained results, to obtain TOAs between the mobile station and the repeaters;

d23. determining the position of the mobile station according to the TDOAs between the adjacent base stations and the repeaters as well as the TOAs between the mobile station and the repeaters, in conjunction with the coordinates of the repeaters and the coordinates of the adjacent base stations.

12. The method for positioning a mobile station according to claim 11, wherein said adjacent base stations include the repeater that is treated as a pseudo adjacent base station.

13. A repeater for implementing the function of positioning the mobile station, comprising a downlink processing channel and an uplink processing channel, wherein said downlink processing channel includes an added auxiliary positioning unit, which receives downlink signals from the base station and signals carrying auxiliary positioning parameters sent from the mobile communication network, generates and sends auxiliary positioning signals to the mobile station.

14. The repeater according to claim 13, wherein said auxiliary positioning unit comprises:

a communication module, which receives signals carrying auxiliary positioning parameters sent from the mobile communication network;

a frame timing recovery module, which receives downlink signals from the base station, processes the signals to obtain a frame synchronization signal, and sends said frame synchronization signal to a timing control module and a pilot modulating module, respectively;

a timing control module, which receives the frame synchronization signal sent from the frame timing recovery

module, generates and sends an pulse sequence to the pilot modulating module;

a pilot modulating module, which receives the frame synchronization signal sent from the frame timing recovery module and the pulse sequence sent from the timing control module, generates and sends auxiliary positioning signals to the mobile station.

15. The repeater according to claim 13, wherein said downlink processing channel comprises a low noise amplifier, a filter, and a power amplifier.

16. The repeater according to claim 13, wherein said auxiliary positioning unit, depending on the actual structure of the repeater, also comprises:

a RF processing module, which comprises an automatic gain control sub-module, a RF receiving and filtering sub-module, and a down frequency converter, and outputs RF signals to an intermediate frequency processing module;

an intermediate frequency processing module, which comprises an intermediate frequency filtering sub-module, an analog-digit converting sub-module, and a digital down frequency converter, and receives RF signals sent from the RF processing module, processes the RF signals and generates base-band signals, and sends the base-band signals to the frame timing recovery module.

17. The repeater according to claim 13, wherein said communication module receives auxiliary positioning parameters from the base station through signaling.

18. The repeater according to claim 13, wherein said communication module receives auxiliary positioning parameters via the operation and maintenance terminal of the

repeater.

19. The repeater according to claim 13, wherein input signals of said auxiliary positioning unit are directly obtained through coupling with the forwarding antenna.

20. The repeater according to claim 13, wherein input signals of said auxiliary positioning unit are obtained from a node in the downlink processing channel of the repeater.

21. The repeater according to claim 13, wherein output signals of said auxiliary positioning unit are outputted after combining with signals from the repeater at a node in the downlink processing channel of the repeater.

22. The repeater according to claim 13, wherein output signals of said auxiliary positioning unit are sent via a forwarding antenna after combining with signals from the repeater before the power of the downlink processing channel of the repeater is amplified.